

THE CURRENT SITUATION OF ENERGY SUPPLY AND DEMAND IN JAPAN

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Abstract

This paper introduces the Japanese Energy Supply and Demand Outlook as well as the comprehensive energy policy based on the report prepared by the Advisory Committee of Energy and Natural Resources, the Ministry of Economy, Trade and Industry in July 2001.

Japan is now considering the ratification of the Kyoto Protocol, and should it be ratified Japan will be obligated to reduce its GHGs emission 6% below the 1990 level by 2010. Reducing its energy-derived CO₂ emission to the 1990 level by 2010 is a prerequisite for achieving this target.

Due to the delay in constructing new nuclear power plants, the energy consumption increased in the transportation, residential and commercial sectors as well as coal as cheap energy source. This has made it extremely difficult to reduce the CO₂ emission by 2010 to the 1990 level only with the current policies. It is estimated that additional CO₂ reduction of 20 million t-C should be required by 2010.

A proposed new energy policy is being proposed to reduce 6 million tC of CO₂ emission by 2010 through further strengthening of energy conservation policies and measures, while reducing additional 9 million t-C by further development and utilization of renewable energy. Another reduction of 5 million t-C to be achieved by fuel shift from coal to natural gas.

Having participated in the process as the vice-chair of the committee, I am supposed to support the report. However, I have somewhat critical view of it.

Introduction

At the outset, I would like to express my appreciation to be given this opportunity to speak on "The Current Situation of Energy Supply and Demand in Japan".

As an introduction, it may be appropriate for me to explain the outline of the report published by the Advisory Committee on Energy and Natural Resources on July 12th 2001 in response to a consultation requested by the Minister of Economy, Trade and Industry. The report was produced after 78 discussion meetings and working groups over 15 months.

As the vice-chair of the committee, I am expected to support the report. However, I would have to be somewhat be critical.

1. New Energy Supply-Demand Outlook

The outlook for energy supply and demand up to 2010, reported at the committee in June 1998, was reviewed because both the supply and demand situation and outlook have changed. The energy demand in the residential and transportation sectors has increased beyond projection as well as the use of low coast coal. This combined with the unexpectedly slow introduction of nuclear and renewable energy. Secondly, if we are to follow the current path it would be impossible to achieve the GHGs reduction target set out in the Kyoto Protocol, to reduce the energy derived CO₂ Emission to the level of 1990. And thirdly, the addition of a new target to reduce energy prices to the internationally reasonable levels by further improving efficiency through deregulation and liberalization on top of the three conventional targets of the 3E Japanese energy policy; to "achieve **economic** growth", "ensure **energy** security" and "address global **environmental** issues".

2. Energy Supply and Demand Trends and Outlooks

(1) As is shown in Attachment 1, energy demand in Japan increased consistently with the exception of the two oil crises. Energy consumption in 1999 was 402 million kl crude oil equivalent or 60 % increase in 30 years, while GDP grew 2.1 times higher during the same period. Therefore, energy use efficiency has been fairly good.

In 1990s, however, GDP growth was as low as 1.3 % per year, while energy consumption grew as high as 1.6%. The energy elasticity to GDP was 1.3.

(2) Attachment 2 shows trends in final energy consumption by sector since 1973, when the first oil crisis occurred. The industrial sector including manufacturing is almost flat

with minor increase due to improvement in energy use efficiency while in the other sectors the figures have been growing sharply regardless of the economic situation: 2.7 times higher for the transportation sector (mainly passenger cars), 2.2 times higher for the household sector and 1.9 times higher for the commercial sector including services for buildings.

Detailed analysis is being conducted to figure out the causes of the increase in these sectors, however, the main causes may be summarized as follows: increase in the number of automobiles owned in suburban areas; increase in the number of individual households due to the development of the aging society and nuclear families; the change of the industrial structure such as the growth of the IT industry; and increase in floor space in buildings due to the expansion of the service industry.

(3) Attachment 3 shows the energy consumption outlook. Energy consumption by sector and its share to the total consumption are shown in this table. The figures for each sector are given up to 1999, and the shares to the total of the industrial sector shows a decline while a significant increase is noted in the residential and transportation sectors.

The outlook is given for two cases: a “Base Case” and “Countermeasures Case” (New Target Case). “Base Case” refers to an outlook for energy consumption under the ongoing energy conservation policy. “Countermeasure Case” (New Target Case) refers to an outlook with a maximum energy conservation measures to cope with the global environmental issues and achieving the CO₂ emission reduction target. In the “Countermeasure Case”, the focus is to maintain the total energy consumption in 2010 at the same level as in 1999. This outlook assumes an economic growth of 2% per year while maintaining the present energy consumption level through energy conservation.

In the previously designed outlook the reduction of 50 oil equivalent million kl of energy consumption had already been planned and compared to business-as-usual outlook, through the introduction of “Keidanren¹” Environment Action Plan and a “top-runner approach”. In the new outlook, however, an additional reduction of energy consumption by 7 million kl is to be achieved by an energy conservation policy mainly for the household, commercial, and passenger cars sectors, in which energy consumption is growing sharply. Under this outlook CO₂ emission reduction by 2010 would be approximately 6 million t C.

¹ “Keidanren”: Association of the Industrial and Commercial major Private Companies in Japan

3. CO2 Reduction Issues in Japan

Why reduce energy demand? As you already know, the new Energy Supply-Demand Outlook was developed on the premise that CO₂ emission must be controlled in order for Japan to achieve the GHGs reduction target in the Kyoto Protocol.

Let me briefly talk about CO₂ emission reduction. The Kyoto Protocol adopted by COP 3 in 1997 set the target for reducing the total GHGs emission by developed economies 5% below the 1990 level from 2008 to 2012 (the first commitment period), the breakdown of which is 6% for Japan, 7% for the U.S., and 8% for EU. In response to this, Japan is to control its energy-derived CO₂ emissions – which accounts for 85% of GHGs – to be on the 1990 level. For Japan, however, who has already anxiously improved the efficient use of energy and has already achieved a high level, this target is extremely difficult to meet. As seen in Attachment 4, its energy-derived CO₂ emissions accounted for 313 million t-C in 1999, which have already been higher by 8.9% than 287 million t-C in 1990. In the Base Case of the Energy Supply-Demand Outlook through to 2010, it would be 307 million t-C, with the ongoing energy conservation measures only, which would be 6.9%, that is 20 million t-C, higher than the 287 million t-C. That is why we have decided to control energy consumption as much as we can by adding energy conservation policies with maximum capability. However, as the maximum CO₂ emission reductions only by energy consumption saving would be limited to 6 million t-C, we have to consider how we could reduce the rest of the amount required, -- that is 20 million t-C – 6 million t-C = 14 million t-C --, from the supply side of energy.

4. Trend and Outlooks in Energy Supply

Attachment 5 summarizes the primary energy supply broken down by sector for 1990 - 1999, as well as the outlook for 2010 in the base and countermeasure (new target) cases in terms of the same definition used for demand projection. It shows slower increase in energy supply premised on the GDP growth of 2% per year: 0.4% per year for the “Base Case” and 0.1% per year for the “Countermeasure Case” (target case).

First of all, regarding petroleum, reducing oil dependency is long and unchanged objective of Japan’s energy policy, and the dependency was reduced to 52% in 1999 from 58% in 1990, and the objective is to achieve 45% by 2010. Meanwhile, the share of Mid-East oil in the total crude oil imports was lowered to 70% in the latter half of 1980s from 78% at the time of the first oil crisis. It has been increasing recently to 86%, a

challenge in ensuring energy security.

As for coal and natural gas, both supply and share are increasing. What is worthwhile noting is that in the “Countermeasure Case”(new target case)), the figures for natural gas increase while those for coal will be controlled by 2010.

The nuclear energy has gone through a major change from the previous outlook. In the previous outlook, it was expected that a capacity of 66 to 70 million kW would be achieved by constructing 17 to 20 units in addition to the 51 nuclear power units as of the end of FY1999 (44.92 million kW, 316.5billion kWh). As a result the nuclear energy would account for 17% share in the primary energy supply. However, in the new outlook, the number of newly constructed units by 2010 was revised to 13, with the total installed capacity of approximately 60 million kW, the electric power generation of 418.6 billion kWh, reflects the increased difficulty in acquiring new sites due to the accident in an uranium processing plant, etc. The share of nuclear energy in the primary energy supply has been revised downward to approximately 15%. Delay in the new construction of nuclear power plants as non CO₂-emitting sources will have a significant impact not only on energy supply planning but also on achieving GHGs reduction in the Kyoto Protocol. This was one of the reasons for this revision to the Energy Supply and Demand Outlook. Moreover, I believe the construction of 13 new units will be difficult.

The share of renewable energy except hydro-power and geothermal (in Japan, this is called “new energy”) in the primary energy supply in 1999 was only 1.3%, 693 kl oil equivalent. The renewable energy is mainly obtained from waste fluid and scraps in the pulp industry. Although it is said that the new energy will not be commercially viable and that economic burden will be heavier, the target of 19.1 million kl oil equivalent has been set in this revision as feasible, as seen in Attachment 6. This assumes that the maximum efforts for cost reduction and technology development be addressed by the both public and private sectors as well as assistance and support given by the government. This target figure is equivalent to 3% of the primary energy supply. In addition, CO₂ emission could be reduced by 9 million t-C. The total renewable energy including hydro-power and geothermal would be 7% of the total primary energy supply in 2010.

5. Outlook for Power Sources and Coal

The attachment 7 covers Electricity Generating Facilities (kW) and attachment 8 the electric power generation (kWh) from 1990 to 2010. I believe I have already sufficiently explained the total picture when I spoke of the primary energy supply.

However, I would like to make brief comments on coal-fired power generation.

Attachment 7 shows the significant growth in the capacity of those plants due to the additional construction of coal-fired power plants by electric utility companies as well as the entry of independent thermal power producers (IPPs). This was the result of the liberalization of the power industry in answer to a strong request to reduce power generation costs.

According to my investigation, coal-fired power generation capacity as of the end of FY 2000 was about 29 million kW and additional capacity under plan by power companies and IPPs was in total approximately 15 million kW. This is consistent with 44 million kW for the “Base Case” in Attachment 7. However, as there are some plans already announced to be cancelled or postponed, or those under consideration of doing so, due to recent slowdown in power demand, this figure seems not likely to be achieved.

Another focus in Attachment 8 is that the electricity generation of coal-fired power plants is substantially reduced in “Countermeasure Case” (target case) in 2010, despite the significant growth in its installed capacity. The target electricity generation for 2010 is stated as 159.9 billion kWh, although 170 billion kWh has already been reached in the actual record for FY 2000.

This is based on an idea called “Fuel Shift in Power Sources”, which was presented by the Secretariat of Agency of Natural Resources and Energy in the final stages of the discussion in the Advisory Committee on Energy and Natural Resources. As I have mentioned earlier, the reduction of 20 million t-C is required to lower the CO₂ emission to the 1990 levels. Even if 6 million t-C could be reduced through enhanced energy savings and 9 million t-C by the strengthening renewable energy development, another 5 million t-C must be reduced. “Fuel Shift in Power Sources” is one solution. This implies guiding the electric power industry to shift fuel for power generation from coal to natural gas (LNG), with relatively less CO₂ emission in existing as well as in new plants. This means either for IPPs and utility companies to voluntarily shift fuel or for the government to provide subsidy to do so or regulate to discourage the use of coal that has cost benefit over other types of fuel. This idea was mentioned in the report as an issue to be considered, but no discussion has taken place on specific policy or measures. I said I am opposed to the idea of suppressing the use of coal, which incidentally no other economy is doing, it would be most foolish to reduce the availability factor of coal-fired plants, by means of taxation, etc.. They were after all constructed under the government policy defining coal as the main alternative source of energy replacing oil and supplying the cheapest power. This does not apply to those plants that will be newly constructed. My opinion was supported by many others but there seems to be no specific consideration of measures on this issue after the report even within the Agency of Natural Resources and Energy. It is

extremely irrational to forcibly suppress the use of coal, which is important from the perspective of Japan's energy security and most effective in reducing electricity prices, just because its CO₂ emissions are relatively higher among fossil energy. Prime Minister Koizumi, however, expressed his opinion in the general policy speech during the current session of that the Diet would pass the ratification of the Kyoto Protocol, which may cause this issue to be brought up again. We should keep our eyes on it.

6. The Ratification of the Kyoto Protocol

I would like to briefly present my opinion regarding the irrationality of the Kyoto Protocol. It goes without saying that long-term CO₂ emission control program should be planned as soon as possible. As for coal, it is of course necessary to use it effectively as a valuable resource given to man. Currently in Japan, Ultra Super Critical Power Generation, with the generation efficiency of 41% at the line-end generation efficiency of 41%, has already been made practicable and other technology development, such as Integrated Coal Gasification Combined Cycle Power Generation (IGCC) and Integrated Gasification Fuel Cell Combined Cycle Power Generation (IGFC) whose target generation efficiency is 44% and 55% respectively, is now being earnestly promoted. This is not only for coal, but technology development to provide a breakthrough for CO₂ emission must be further promoted in every sector of energy production and consumption regardless of the time it takes. This must be diffused to developing economies that will undergo industrialization in the future. This should be the right path for solving the global environmental issues. Yet it must not to be accomplished through regulations and tax systems that will pressure individual firms..

It is an extremely difficult challenge for Japan to bring CO₂ emission back to the 1990 level by 2010 as we have established the most efficient society in energy production and consumption due to the efforts made after the oil crises.

Considering significant costs for further CO₂ emission reduction in Japan compared to Germany, who is restructuring its inefficient production system drastically after the integration with former East Germany in 1990, and the U.K., who has switched from its domestic coal to natural gas coming from the North Sea fields, it can be said the GHGs reduction targets of 8% for EU and 6% for Japan are extremely unfair. In addition, it would be extremely dangerous for Japan to solely ratify the Kyoto Protocol while the U.S. who is responsible for one fourth of the world CO₂ emission and one third of developed economies' CO₂ emission has dropped out, and developing economies that would be responsible for half of the world's CO₂ emission in 2020 do not assume any reduction

obligations. Recently, “Keidanren” and the Japan Chamber of Commerce and Industry have shown their view that they are against taking the risk of ratifying the Kyoto Protocol for the time being, indicating the danger of weakening industrial competitiveness, de-industrialization, and the increase of unemployment. We should keep our eyes on a movement around ratification in the current Diet session.

7. Deregulation in the Electricity Industry

I would like to conclude my presentation by talking about the deregulation of the Japanese utility industry.

Almost two years have passed since the power retail business was partly liberalized, in March 2000. The central government and local municipalities are concluding their power supply contracts through competitive bidding. On the other hand nine companies including major trading houses, gas utilities, and iron & steel mills applied for entry into the utility market. However, their capacity limited as they are just reselling surplus electricity generated in-house by material producers such as iron and steel mills. Their market share is less than 1%. This is far from the introduction of genuine competition. The Ministry of Economy, Trade and Industry is now reviewing the power deregulation scheme. By the end of this year it will present their conclusion on such issues as reviewing the power industry system including the expansion of deregulation, pros and cons for the establishment of the electricity pool market and power transmission rule between the new comer and power utility companies. This trend of deregulation of the power industry has caused a substantial reduction of electricity rates. Each electric utility company in Japan has implemented a rates reduction of approximately 5% in October 2000, and additional reduction is scheduled this spring. With expanded deregulation, further rates cut is likely in the future as well. As a result, enhanced sensitivity to fuel prices and a diversity of fuel supply would be required. In the future there will be greater sensitivity to fuel prices due to the possibility of losing the economic advantage of coal as mentioned above as well as the need to reduce electricity rates in Japan.

Thank you very much for your kind attention.

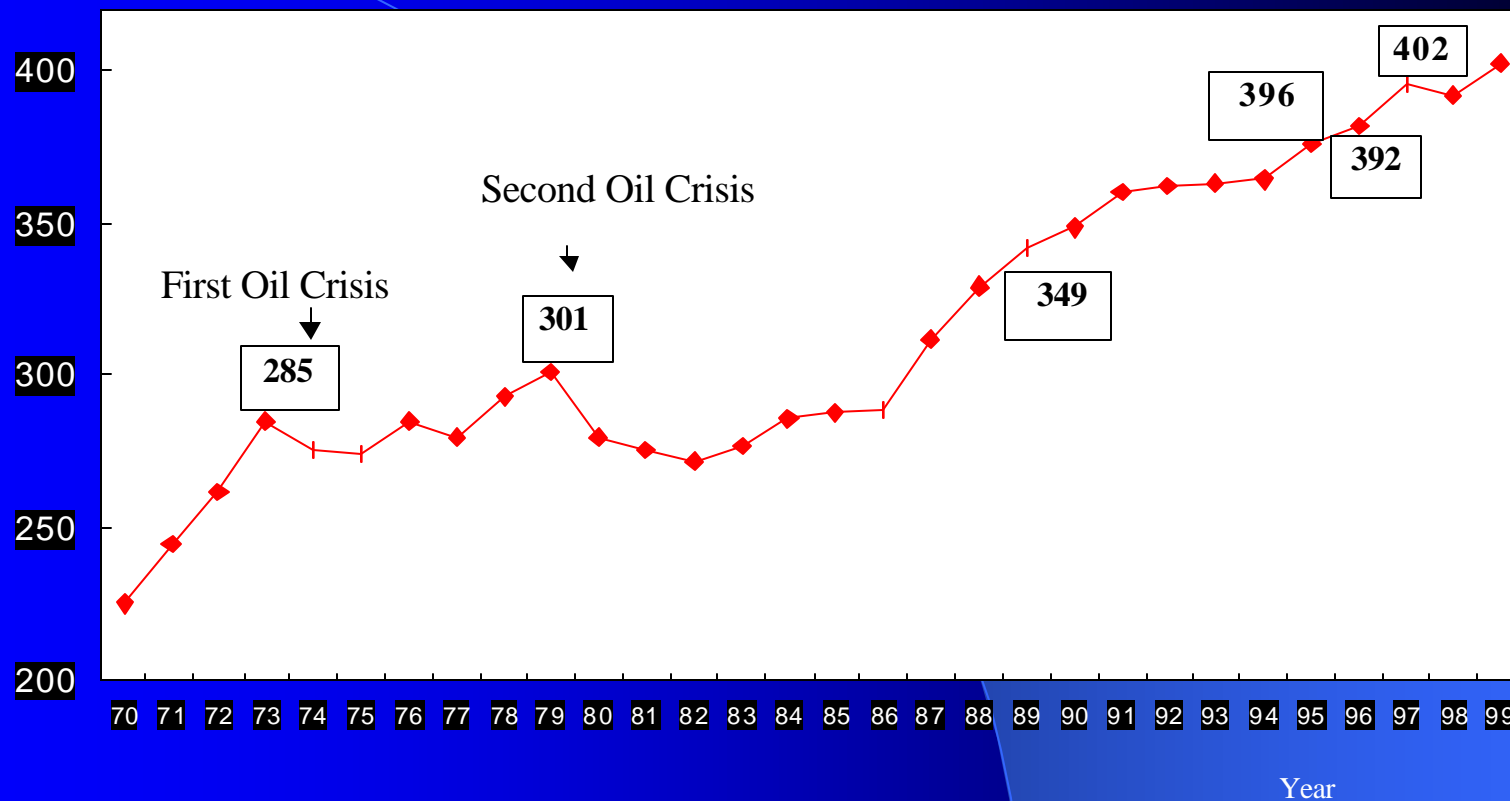
The Current Situation of Energy Supply and Demand in Japan

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Attachment 1

Final Energy Consumption

Unit: Million kl Crude Oil Equivalent

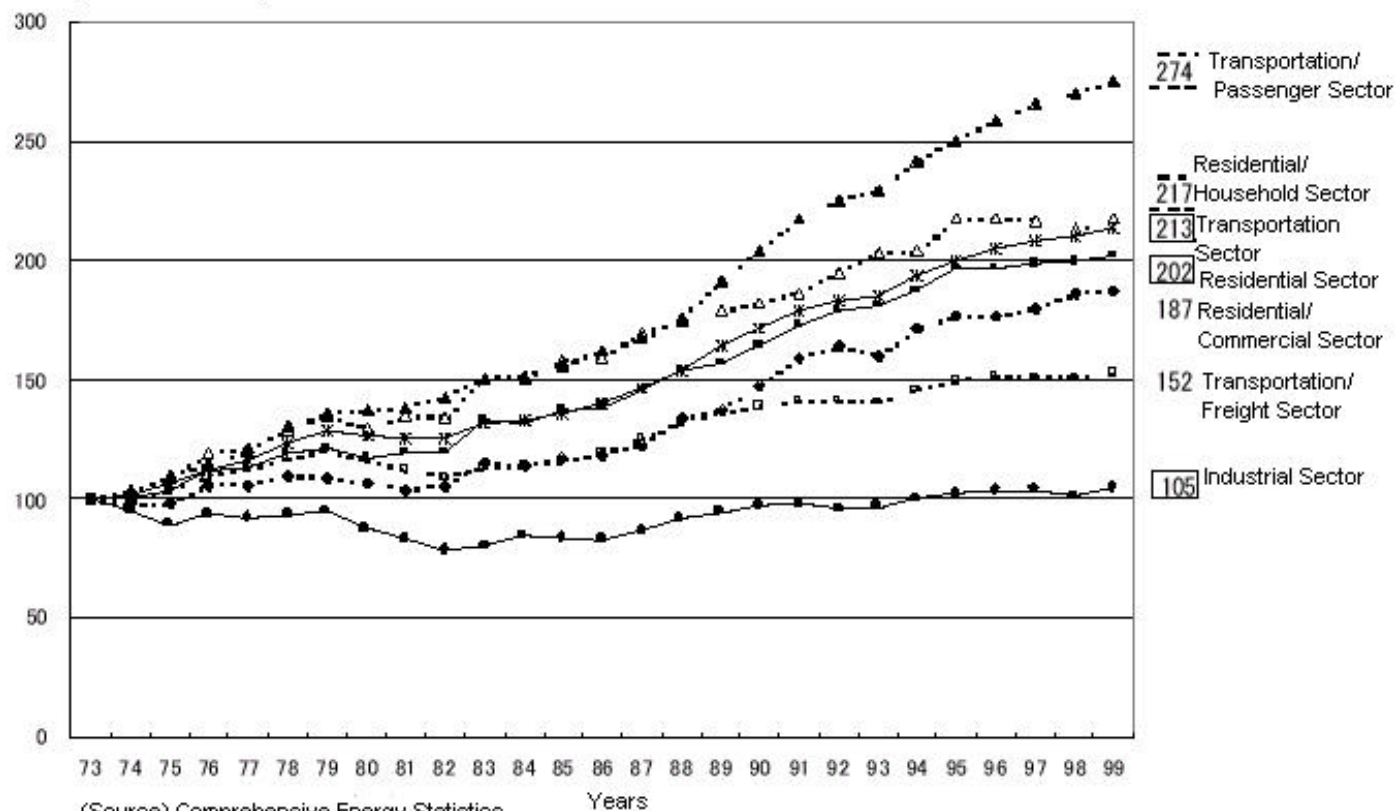


(Source) Comprehensive Energy Statistics

Attachment 2

Final Energy Consumption by Sector

Index: (year 1973= 100)



Attachment 3

Summary of Long-Term Energy Supply and Demand Outlook

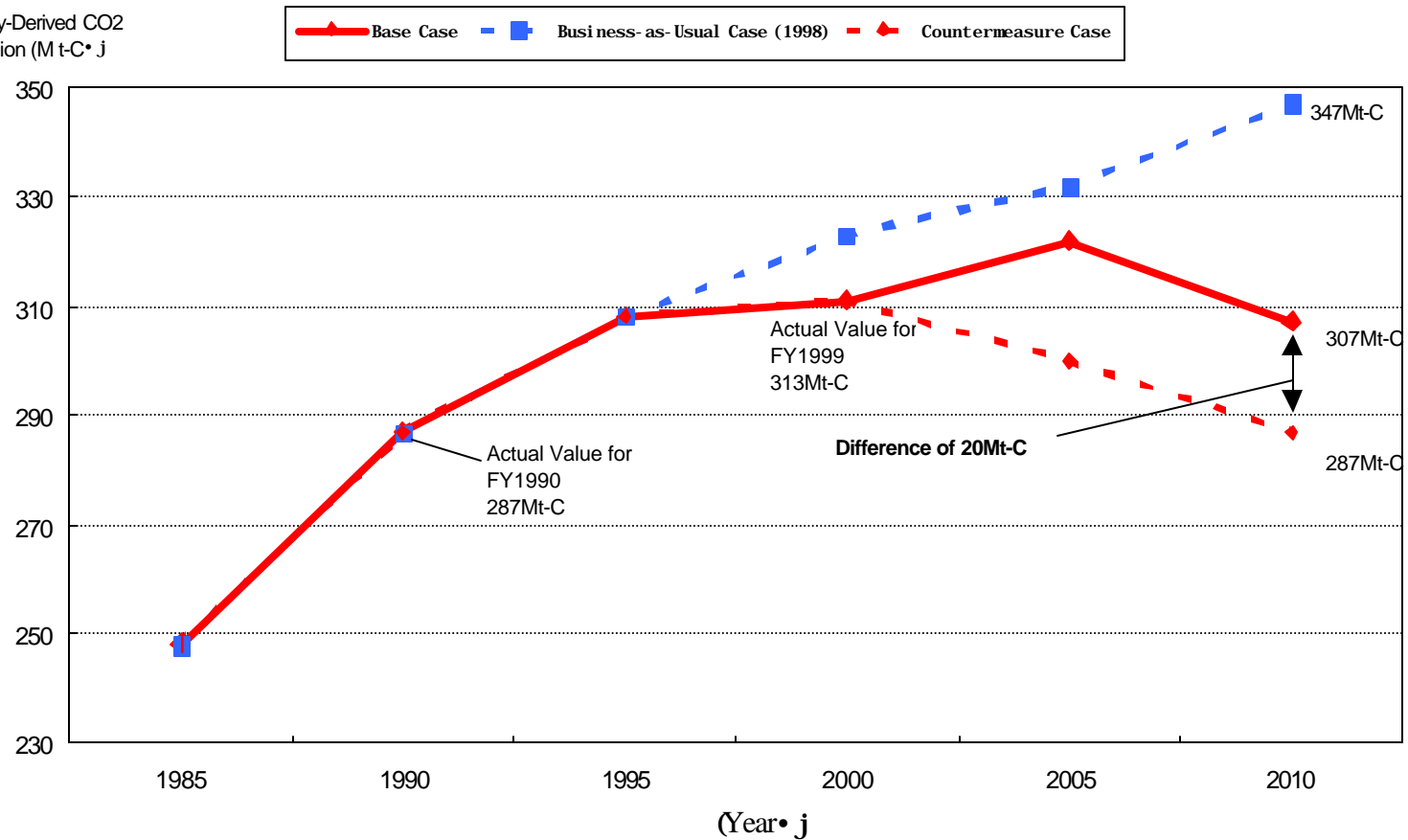
(unit: Million kl Crude Oil Equivalent)

Year Item	FY 1990		FY 1999		FY 2010			
					Base Case		Countermeasure Case	
		Shares %		Shares %		Shares %		Shares %
Industrial	183	52.5	197	49.0	187	45.8	185	46
Residential	85	24.4	105	26.1	126	30.8	120	30
Household	46	13.3	55	13.8	60	14.7	58	14
Commercial	39	11.2	50	12.3	66	16.1	63	16
Transportation	80	23.0	100	24.9	96	23.4	94	24
Passenger	39	11.0	53	13.2	51	12.5	50	12
Freight, etc	42	12.0	47	11.7	45	10.9	45	11
Total	349	100	402	100	409	100	400	100

Attachment 4

CO₂ Reduction Scenario (Countermeasure Case)

Energy-Derived CO₂
Emission (Mt-C•j)



Attachment 5

Trend and Outlook in Primary Energy Supply

					(Unit: Million kl Crude Oil Equivalent)			
	FY 1990		FY 1999		FY 2010			
					Base Case		Countermeasure Case	
Primary Energy Supply	526		593		622		602	
Types of Energy Supply	Actual	Share %	Actual	Share %		Share %		Share %
Oil	307	58.3	308	52.0	280	45.0	271	45
Coal	87	16.6	103	17.4	136	21.9	114	19
Natural Gas	53	10.1	75	12.7	82	13.2	83	14
Nuclear	49	9.4	77	13.0	93	15.0	93	15
Hydro	22	4.2	21	3.6	20	3.2	20	3
Geothermal	1	0.1	1	0.2	1	0.2	1	0.2
New Energy, etc	7	1.3	7	1.1	10	1.6	20	3
Renewable Energy*	29	5.6	29	4.9	30	4.8	40	7
*Note: Renewable Energy includes New Energy, Hydro and Geothermal.								

Attachment 6

Targets for Renewable Energy Excluding Hydro and Geothermal

	FY 1999		FY 2010				
			Base Case		Countermeasure Case		
	Oil Equivalent	Installation Capacity	Oil Equivalent	Installation Capacity	Oil Equivalent	Installation Capacity	2010/1999
	(1,000kl)	(MW)	(1,000kl)	(MW)	(1,000kl)	(MW)	
Photovoltaics	53	209	620	2,540	1,180	4,820	23 times
Wind Power	35	83	320	780	1,340	3,000	38 times
Waste Power	1,150	900	2,080	1,750	5,520	4,170	5 times
Biomass Power	54	80	130	160	340	330	6 times
Solar Thermal Utilization	980	-	720	-	4,390	-	4 times
Unused Energy (snow, ice & cryogenic heat)	41	-	93	-	580	-	14 times
Waste Thermal Utilization	44	-	44	-	140	-	3 times
Biomass Thermal Utilization	-	-	•	-	670	-	•
Waste Fluid & Scrap Wood	4,570	-	4,790	-	4,940	-	1.1 times
Total New Energy Supply	6,930	-	8,780	-	19,100	-	3 times

Attachment 7

Trend and Outlook in Installed Capacity & Electricity Generating Plans at Fiscal Year End

(Unit: M W)								
Item	FY 1990		FY 1999		FY 2010			
					Base Case		Countermeasure Case	
Installed Capacity at Fiscal Year End (Electric Utilities)	172,120		224,100		266,570		252,880 • 272,290	
Generation Type	Actual	Share (%)	Actual	Share (%)		Share (%)		Share (%)
Thermal	104,080	60.5	134,340	59.9	153,430	57.6	146,700 • 162,200	57.0 • 59.6
Coal	12,230	7.1	24,880	11.1	44,100	16.5	31,550 • 44,130	12.3 • 16.2
k m f	38,390	22.3	56,770	25.3	67,020	25.1	66,060 • 66,960	24.6 • 26.1
Oil, etc	53,470	31.1	52,700	23.5	42,310	15.9	49,080 • 51,110	18.8 • 19.4
Nuclear	31,480	18.3	44,920	20.0	61,850	23.2	57,550 • 61,850	22.7 • 24.1
Hydro	36,320	21.1	44,330	19.8	50,710	19.0	48,100	17.7 • 19.0
Ordinary	19,310	11.2	20,020	8.9	20,700	7.8	20,690	7.6 • 8.2
Pumping-up	17,010	9.9	24,310	10.8	30,010	11.3	27,410	10.1 • 10.8
Geothermal	240	0.1	520	0.2	590	0.2	540	0.2

Note: The figures in the above outlook are calculated on a particular assumption, and should be understood with a certain degree of tolerance.

Attachment 8

Trend and Outlook in Electric Power Generation by Power Sources

(Unit: 100 Million kWh)								
Item \ Year	FY 1990		FY 1999		FY 2010			
					Base Case		Countermeasure Case	
Electric Power Generation	7,376		9,176		10,292		9,970	
Power Types	Actual	Share (%)	Actual	Share (%)		Share (%)		Share (%)
Thermal	4,466	60.5	5,063	55.2	5,074	49.3	4,680	47.0
Coal	719	9.7	1,529	16.7	2,351	22.8	1,599	16.0
, k m f	1,639	22.2	2,405	26.2	2,341	22.7	2,549	26.0
Oil, etc	2,108	28.6	1,129	12.3	383	3.7	533	5.0
Nuclear	2,014	27.3	3,165	34.5	4,186	40.7	4,186	42.0
Hydro	881	11.9	893	9.7	966	9.4	952	10.0
Ordinary	788	10.7	769	8.4	803	7.8	803	8.0
Pumping-up	93	1.3	123	1.3	163	1.6	149	1.0
Geothermal	15	0.2	34	0.4	37	0.4	37	0.4
New Energy	-	-	21	0.2	29	0.3	115	1.0
CO ₂ Emission Intensity •g-c/kWh• j	101.9		89.9		82.6		73.6	

Note: The figures in the above outlook are calculated on a particular assumption, and should be understood with a certain degree of tolerance.

The background is a solid blue color with a subtle gradient. A thin, light blue curved line starts from the left edge and arcs towards the center. A larger, semi-transparent blue triangular shape is positioned in the lower right quadrant, pointing towards the center.

Thank you for your attention!!